Archery and Pro Line Co., 804 F.2d 135, 138, 231 U.S.P.Q. 644, 646 (Fed. Cir. 1986). The Examiner states that a non-oxide electrode, such as TiN is provided and points to reference numeral 42 and the Table in Cols. 5 and 6. As taught by Summerfelt et al. reference numeral 42 is not an electrode, but a **buffer** layer. The electrode layer is reference numeral 34, which is La doped $BaSrTiO_3$. This electrode layer is an oxide electrode as it includes oxygen. Therefore, a non-oxide electrode as claimed by the Examiner, is not provided.

The Examiner states that depositing a high dielectric constant oxide dielectric 36 on the oxidized surface of the non-oxide electrode is taught in col. 4, lines 25-54. The Examiner concedes that Summerfelt et al. discuss minimizing oxidation of the TiN layer to prevent TiO_2 from forming since it is insulative. The Examiner then asserts that Summerfelt et al. do not completely arrest the oxidation of the TiN layer, but merely minimizes it.

At col. 4, lines 25-54, Summerfelt et al. teach that the high dielectric constant oxide dielectric material is deposited over the lower electrode. As stated above, the lower electrode layer is reference numeral 34, which is La doped $BaSrTiO_3$. This electrode layer is an oxide electrode as it includes oxygen. Furthermore, the lower electrode is deposited under reducing conditions, not oxidizing conditions, therefore, the lower electrode does not have an oxidized surface. See col. 4, lines 55-58.

The Examiner asserts that Summerfelt et al. teach oxidizing an upper surface of the TiN layer in Col. 4, lines 50-67. The lower electrode, once deposited covers the TiN electrode buffer layer while the high dielectric constant oxide dielectric material is being deposited over the lower electrode. The upper surface of the TiN electrode buffer layer is protected from oxidation by the lower electrode. Thus, the upper surface of the TiN electrode buffer layer would not be not oxidized.

Thus, Summerfelt et al. does not teach every element of the claimed invention. Therefore, claims 1, 4, and 9 are novel over Summerfelt et al. Summerfelt does not

suggest providing a method forming a capacitor that includes depositing a high dielectric constant oxide dielectric material on the oxidized surface of a non-oxide electrode. Therefore, claims 1, 4, and 9 are patentable over Summerfelt et al.

Claims 2, 3, 5-8, 10-29, and 38-41 have been rejected under 35 USC § 103(a) as being unpatentable over Summerfelt et al. The Examiner asserts that Summerfelt et al. teaches a method for forming a capacitor, comprising: providing a non-oxide electrode (42), such as TiN; depositing a high dielectric-constant oxide dielectric material (34, 36) on the oxidized surface of the non-oxide electrode; and depositing an upper electrode (38). Applicant would like to respectfully point out that reference numeral 34 is directed to the electrode which is conductive, not the dielectric layer which is insulative.

The Examiner admits that Summerfelt et al. does not teach: 1) providing a field effect transistor having a pair of source/drain regions, wherein one of the source/drain regions is connected to the capacitor electrode and the other source/drain region is connected to a bit line; 2) a method wherein the high-dielectric oxide is Al_2O_3, Ta_2O_5 or $Ba_xSr_{(1-x)}TiO_3$; 3) a method, wherein the oxidation is carried out in a temperature ranger of 250° to about 700° C, or 250° to about 500° C; 4) a method, wherein the oxidation is carried out in an O_2, O_3, H_2O or N_2O gas; and 5) a method, wherein the oxidation of the upper surface is performed in an oxide dielectric deposition chamber prior to deposition of the high-dielectric constant oxide material. After stating the above admissions, the Examiner then asserts that the subject matter of each of the above admissions would have been obvious to one of ordinary skill in the art.

There is nothing in Summerfelt et al. that would suggest or motivate one of ordinary skill in the art to oxidize the upper surface of the non-oxide electrode and then deposit a high dielectric constant oxide dielectric material over the oxidized surface of the non-oxide electrode as recited in the claimed invention because Summerfelt et al. teach away from oxidizing the upper surface of a non-oxide electrode. At col. 4, lines 48-67.

A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. *In re Gurley*, 31 USPQ2d 1130, 1131 (Fed Cir. 1994). The degree of teaching away will of course depend on the particular facts; in general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant. *Id.*

Summerfelt et al. teach away from the claimed invention because Summerfelt et al. does not want the TiN electrode buffer layer 42 to be oxidized. Summerfelt et al. teach that in order to **minimize** oxidation of the TiN lower electrode buffer layer, the BST lower electrode is deposited in a slightly reducing atmosphere. See col. 4, lines 55-60. Summerfelt et al. further explain that the deposition of the undoped high-dielectric-constant BST layer 36 generally requires oxidizing conditions. See col. 4, lines 58-60. The BST lower electrode 34 will protect the TiN electrode buffer layer 42 and inhibit formation of a substantially oxidized continuous resistive contact layer. See col. 4, lines 60-64. Thus, the TiN electrode buffer layer is not **purposefully** oxidized, but rather may only possibly be incidentally oxidized due to the environment which is required for the deposition of the other layers of the capacitor.

The totality of a reference's teachings must be considered. *Id., citing W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1550-51, 220 USPQ 303, 311 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). When the totality of the reference's teachings are considered, it is apparent that Summerfelt et al. teach a completely different capacitor that is formed in a completely different manner. The capacitor taught in Summerfelt et al., as explained above, has a TiN upper electrode 38 that overlays an undoped BST layer 36, which in turn overlays a lightly La donor doped BST lower electrode 34. The lightly La donor doped BST 34 is formed on a TiN electrode buffer layer 42. The TiN electrode buffer layer 42 is used as a sticking layer and diffusion barrier for silicon, oxygen and impurities in the high-dielectric-constant BST layer 36. Summerfelt et al. explains that the BST lower electrode 34 is deposited in a slightly reducing atmosphere when the TiN

electrode buffer layer 42 is used in order to minimize the oxidation of the TiN. Furthermore, The BST lower electrode 34 overlies the TiN electrode buffer layer 42, thereby, protecting the TiN electrode buffer layer 42 from oxidation while the high-dielectric constant BST layer 36 is deposited. It is clear when reading the totality of the reference's teachings, that steps are taken in the formation of the capacitor taught Summerfelt et al. to assure that the TiN electrode buffer layer 42 is protected from oxidating circumstances.

Finally, there is no teaching or suggestion in Summerfelt et al. that a high dielectric constant oxide dielectric material is deposited on the oxidized surface of the TiN electrode buffer layer, as recited in the claims. Summerfelt et al. does not teach or suggest a specific portion of the TiN electrode buffer layer 42 that is oxidized. Therefore, there can be no teaching or suggestion that a high-dielectric-constant material is deposited on the oxidized surface.

As stated above, the Examiner admits that certain features are not taught by Summerfelt et al., but then states that these features would have been obvious to one of ordinary skill in the art. The recited features are either included in a claim that depends from an independent claim or are included within an independent claim that recites the steps of oxidizing an upper surface of the non-oxide electrode and depositing a high dielectric constant oxide dielectric material on the oxidized surface of the non-oxide electrode. As shown above, these steps are novel and nonobvious over Summerfelt et al. and therefore patentable. Thus claims 2-3 and 5-8, which dependent ultimately from independent claims 1 and 9, and claims 10-29, and 38-41 are nonobvious and patentable over Summerfelt et al.

Serial No. 09/903,160
Atty. Docket No. MIO 0062 PA

CONCLUSION

Applicants respectfully submit that, in view of the above remarks, the application is now in condition for allowance. Early notification of allowable subject matter is respectfully solicited.

Respectfully submitted,

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